CLAIMS

1. A process for training a pattern recognition system comprising the steps of:

(a) providing a training set of objects each classified in two or more classes,

(b) taking data from each of the objects,

(c) selecting a first discriminant space and computing discriminant values from the data,

(d) plotting the values in the discriminant space,

(e) establishing a decision boundary associated with the discriminant space,

(f) setting the decision boundary and applying a decision rule wherein at least one object in the training set is separated and correctly classified,

(g) removing correctly classified objects from the training set, thereby creating a remaining set of objects,

(h) storing the first discriminant space, corresponding decision boundary and decision rule, and

(i) repeating steps (a) through (g) with the remaining set of objects.

2. The process as defined in claim 1 further comprising the steps of: defining a range of positions of the decision boundary from a first location, that properly classifies all objects of one class, to a second location that properly classifies all objects of a second class, and positioning the decision boundary at any point from the first to the second locations, wherein the distance or margin between any two classes may be maximized or minimized.

3. The process as defined in claim 1 wherein the repetitions of step (a) includes selecting the same or a different discriminant space.

4.   The process as defined in claim 1 further comprising the steps of selecting a

number of objects in the remaining set of objects such that when that number or zero is

reached the pattern recognition system is trained.

5.   The process as defined in claim 4 further comprising the steps of:

introducing a set of objects, the objects known to be members of the two or more

classes but unclassified as to which class, to the trained pattern recognition system,

taking data from the unclassified objects,

retrieving the first stored discriminant space, decision boundary and decision rule,

computing discriminant values from the data and plotting the values in the

discriminant space,

applying the decision boundary and decision rule to the plotted values,

removing classified objects from the unclassified set,

sequentially retrieving the next discriminant space, decision boundary and

decision rule and applying them to the diminishing unclassified set of objects.

6.   The process as defined in claim 5 further comprising the steps of repeating the

process as defined in claim 5 until the unclassified objects or the stored discriminant

space, boundaries and decision rules are exhausted.

7.   The process of classifying unclassified objects using a pattern recognizer as

trained and defined in claim 4 comprising the steps of:

introducing unclassified objects to the trained pattern recognition system,

taking data from the unclassified objects,

retrieving the all of the stored discriminant spaces, decision boundaries and

decision rules,

computing discriminant values from the data and plotting discriminant values in the discriminant spaces,

applying corresponding decision boundaries and decision rules to all the plotted data in parallel, wherein each decision rule classifies objects of a particular class , and combining objects in the same class.

8.   The process as defined in claim 7 wherein the step of combining groups of all objects of at least one class.

9.   The process as defined in claim 7 wherein each step of applying classifies a portion of one class from the unclassified objects.

10.   The process as defined in claim 7 wherein the logical output grouping comprises a fuzzy determination of the likelihood of the object being within a class.

11.   A process for training a Fourier filter pattern recognition system with a training set of patterns positioned in an x,y plane known to be in two or more classes, comprising the steps of:

(a) modulating a coherent light beam by each of the patterns,

(b) optical Fourier transforming the modulated coherent light beam.

(c) masking or filtering the Fourier transformed beam thereby providing a masked output,

(d) optical Fourier inverse transforming of the masked output, thereby forming an optical signal positioned in a plane that corresponds to the corresponding positions in the x,y plane,

(e) sensing the optical output of step (d),

(f) applying a threshold to the sensed optical outputs,

(g) determining the x,y positions of the sensed optical signals that exceed the threshold, and classifying those patterns located at the corresponding x,y positions,

(h) removing those classified patterns from the remainder of the training set,

(i) storing the masks and the thresholds, and

(j) repeating steps (a) through (f) with the remainder of the training set, thereby training said system.

12.   The process of classifying unclassified patterns using a Fourier filter recognizer system as trained and defined in claim 11 comprising the steps of:

   introducing unclassified patterns to the trained pattern recognition system,

   retrieving the stored masks, and applying steps (a) through (h) repetitively.

13.   The process of classifying unclassified patterns using a Fourier filter recognizer system as trained and defined in claim 12 comprising the steps of:

   introducing unclassified patterns to the trained pattern recognition system,

   modulating the light beams with the patterns,

   applying the each of the stored masks and corresponding thresholds to the unclassified objects in parallel, wherein each application provides an output classified grouping.

14.   The process as defined in claim 13 wherein the application of each the stored masks and corresponding thresholds produces the logical determination that all of one class have been separated from the unclassified objects.

15.   A process of improving the performance of an existing pattern recognition system, wherein the existing system has defined discriminants comprising the steps of:

accumulate objects misclassified or unclassified by the existing system,

using these mis-classified objects as a training set, and applying the process as defined in claim 1 to said training set defined herein.

16.   A pattern recognition system comprising:

(a) a training set of objects each classified in two or more classes,

(b) means for taking data from each of the objects,

(c) means for selecting at least one discriminant space and means for computing discriminant values from the data,

(d) means for plotting the values in the discriminant space,

(e) a decision boundary associated with the discriminant space,

(f) a decision rule, defined with respect to the decision boundary, wherein at least one object in the training set is separated and correctly classified by application of the decision rule,

(g) means for removing correctly classified objects from of the training set, thereby creating a remaining set of objects thereby training said pattern recognition system;,

(h) means for storing the at least one discriminant space, corresponding decision boundary and decision rule,

(i) means for introducing a set of objects known to be members of the two or more classes but unclassified as to which class, to the trained pattern recognition system,

(j) means for taking data from the unclassified objects,

(k) means for retrieving the at least one stored discriminant space, decision boundary and decision rule,

(l) means for computing discriminant values from the data and plotting in the discriminant space,

(m) means for applying the decision boundary and decision rule to the plotted values,

(n) means for removing classified objects from the unclassified set, and

(o) means for sequentially retrieving the next discriminant space, decision boundary and decision rule and applying them to the diminishing unclassified set of objects.

17.   The system defined in claim 16 wherein the decision boundary, that is arranged to separate at least one object and correctly classify that object, is arranged to also maximize the relative distance from the boundary decision to the nearest object of a different class.